and moon may be so timed as to bring about great tides in certain parts of the ocean but none in other parts. The barometric waves, shown in Professor Henry's barograms in the REVIEW for July, 1899, seem to have been so timed as to produce and maintain unusual disturbances for a few hours in the surface of the water at Marquette, Mich. Tide gages both on the ocean shores and on the lakes, always show many rythmic oscillations depending on the many possible rates of oscillation of the water immediately surrounding the gage and the deep water off shore. It is generally difficult to trace these disturbances back to their ultimate origin. Sometimes a far distant earthquake shock starts a long slow wave that crosses the ocean and produces a regular series of gentle oscillations at the mouth of a harbor to which the tide gage within the harbor responds as best it can; at other times successive gusts of wind from some special direction are so timed as to set the waters of the harbor itself into rythmic motion. Any source of disturbance, no matter how slight, provided only that it come at the proper intervals, may set the ocean, the atmosphere, or the earth itself, into responsive oscillations.

Illustrations of the power of systematic well-timed impulses are familiar to every one who watches the mechanical operations going on about us. When half a dozen men wish to pull over a great tree, the rope is tied half way up; they set the tree into oscillation; they pull when the tree is coming toward them and cease pulling when it flies back, until finally a few oscillations of rapidly increasing extent bring the monarch low. A few men keeping step as they tramp across a bridge may soon set up dangerous oscillations until the iron rods and beams begin to snap. Two pendulum clocks standing beside each other on a shelf will often so influence each other, through the oscillations that are communicated to the supports, that the pendulums are forced to vibrate in unison. Musical instruments offer many illustrations of resonance due to well-timed rythmic vibrations.

LONG BALLOON VOYAGES.

It is well known that efforts to obtain continuous records at great altitudes for several days, in order to determine the diurnal variations of temperature, pressure, and wind, are great desiderata in meteorology, but are difficult to attain, because neither balloon nor kite can be kept at a uniform altitude for so long a period. The kite has, indeed, been kept in mid-air for two days, but its altitude varies to an important extent during that interval. The captive balloon can be held at a low altitude if the wind is not too strong; for high altitudes we must rely upon the free balloon manned by intelligent aeronauts, who shall so adjust the buoyant gas and the sand ballast as to maintain a fairly uniform altitude. The problem of a journey of several days' duration, at a uniform altitude, has been discussed with much care by Prof. S. A. King, the well-known aeronaut of Philadelphia, Pa., who has always maintained that it should be perfectly feasible for him to journey safely from America to Europe. Of course the expense of preparation has hitherto hindered him from making the attempt. We see by a recent dispatch from Berlin that the German aeronauts are arranging for an experimental trip of this kind about the middle of June. The main object will be to ascertain how long a balloon can be kept in mid-air, in spite of changes of temperature by day and night, which necessitate the ultimate loss of gas and ballast until, finally, the balloon must come to the earth. It is said that the present experimental balloon will contain 300,000 cubic feet of gas and the car will accommodate five persons, provisioned for ten days. These are about the same arrangements that were made for the famous ascension at Minneapolis, Minn., September 12, 1881, when Professor Upton accompanied Professor King, with every convenience for a long voyage. Professor Upton's account of this trip is given in the Annual Report of the Chief Signal Officer for 1882, pages 862–880. Unfortunately, the actual time of ascent was controlled by the authorities of a State fair, who had defrayed all the expenses, and although the balloon remained full of gas from September 12 to September 15, yet no extended journey was accomplished. Subsequent journeys with other balloons have been made by Professor King, with accompanying observers, but we believe the longest time that a balloon has been kept in the air during an actual journey in this country was about fourteen hours, in the aeronautic voyage of Mr. Wise from Buffalo toward New York, N. Y.

WIRELESS TELEGRAPHY.

A paragraph is being circulated in the press to the effect that the Weather Bureau is utilizing the piano wire that is used as kite strings in developing a new method of wireless telegraphy. This ingenious invention of the daily press has been seriously criticized by other newspapers, and it is perhaps worth while to say that the Weather Bureau has as yet done nothing of the kind. Our experience in the use of piano wire for kite string has, indeed, served to show that currents of atmospheric electricity are generally flowing along the wire with sufficient force to prevent its use for wireless telegraphy. In fact, there are so many obstacles to be overcome in the use of the ordinary Marconi system that it is hardly proper to speak of what has been done with other systems until the prospect of thoroughly useful practical results has become a certainty rather than a speculation. Meantime, however, it must be evident to all that the country expects the Weather Bureau to perfect some method of easy communication with vessels at sea, if in any way practicable, in order to warn them of storms and save life and property. We understand that some German steamers are already systematically using the Marconi system to announce their arrival and departure, but it may be easily seen that the great desideratum is a system of wireless telegraphy so simple that it shall commend itself to the use of all nations (like the Morse system of telegraphy and the Bell telephone), so that the same system may be used by all vessels that approach our shores.

STORMS OF SLEET.

We have before referred to the fact that owing to the great destructiveness of sleet in breaking down branches of trees and tender vegetation, telegraph wires, and even roofs of large buildings, it is desirable that there should be a special study of the sleet storms, their statistics, causes, and destructibility. In this connection we call attention to a short article by Hermann von Schrenk on the severe sleet storm of February 27, published in the Transactions of the Academy of Science at St. Louis, Vol. X, No. 5. Mr. von Schrenk gives some estimates and measurements of the amount of ice accumulating upon trees and other objects. Thus, in a storm of February, 1882, a cedar tree ten feet high, with its spreading branches, carried 400 pounds of ice. In a German storm a spruce tree three and a half feet high carried 165 pounds. In a French storm of 1879, described by Jamin, it is stated that a branch weighing 13 grams carried a load of 360 grams of ice. As to the storm of February 27, von Schrenk weighed about 200 branches of a variety of trees to determine what weights of ice the trees were able to withstand. The ratio of the weight of the smaller twigs to the ice incrusting them averaged about 15, but varied from 6 to 35. No estimate is

given by the author as to the total weight carried by any one tree or shrub, but he calls attention to the fact that the twigs on the outside of the tree had more ice to bear than those on the inside, and that the smaller, by resting against each other and the larger ones, caused the whole mass of ice inclosing a tree to freeze together as a unit, so that one branch could not be moved without moving the rest.

The varieties of trees that were most easily injured were the soft maples, the arbor vitæs, pines, honey locusts, oaks, ash, peach, and apple; those least injured were the cypress, the gingko, and the horn beam.

The effect of the strong wind upon a tree is, in general, not so great as that of the sleet. The weight of the latter is a steady downward pressure while the wind acts in temporary gusts and more nearly horizontally. When the wind comes in violent gusts, blowing from above downward, it may be as destructive as sleet.

If a voluntary observer could arrange to catch all the sleet that he can shake down from a heavily laden tree, and add a small percentage for that which melts and is lost to his measurement, he could easily give us some interesting data with regard to the total weight of sleet carried by trees of different heights, ages, and species.

THE COLD WAVES OF JANUARY AND FEBRUARY, 1864.

Mr. J. Nelson Trask, of New Salem, Franklin County, Mass., in response to the Editor's note in the January REVIEW, page 17, writes as follows with reference to the cold wave referred to by Mr. R. M. Harding:

I was on the west shore of Port Royal Island, S. C., where the sharpest turn of temperature began on the afternoon of Friday, January 1, 1864. I had no thermometer, but here are the facts from my record:

New year came in with a sweeping northwester, which drove the recent warm storm and thunder showers out to sea. (That is the way we used to say it.) The day, Friday, was very windy. Saturday morning ice three-fourths of an inch thick in a rain barrel 18 feet above the ground. No thawing through the day. Sunday morning, January 3, ice 1¼ inch thick. During the day the freeze let up; thawed considerably.

February 18 brought another turn; cold with a northeasterly wind; a little fine snow at evening; night cold.

February 19.—Cold, with north wind.

February 20.—Morning calm; cold enough to freeze over the pool northeast of the stable and make ice half an inch thick in the water barrel; later, wind sprang up from the northeast, veering to northwest and west; milder at evening; flowers laid out for their own funerals; orange leaves made to wilt.

February 21.—Frost, but the temperature evidently much higher than yesterday morning. The frost of the 20th seems to have blasted all the orange trees on this, Woodward, place. The live oaks, though by no means killed, are much denuded; the magnolias are as green as ever, so the bays, but the myrtles are losing most of their leaves; oleanders have felt the cold severely, some apparently killed; rosebuds that would have opened within a week were killed; narcissus, daffodil, jonquil fell flat upon the ground. The orange and oleander trees were not killed to the ground, but the limbs were withered down about an arm's length; no fruit and no nosegays next summer from these trees. Creeping blackberries fruited wonderfully.

A BLACK RIVER THAW.

In the northern portion of the State of New York, the Adirondack region, which is famous for its heavy snowfall, is also subject to corresponding severe floods due to the melting snow. The Black River which empties into Lake Ontario at Sacketts Harbor, drains the southwestern quarter of the Adirondack region and the intermediate country to the shore of Lake Ontario, a region that is particularly subject to long snowstorms followed by warm rains. As the thaw and the high water are the almost inevitable consequences of a long snowstorm, the latter is humorously called the "Black River thaw."

SUDDEN DISAPPEARANCE OF ICE IN THE LAKES.

It is often remarked that ice disappears from the Great Lakes most suddenly and unexpectedly. At night-time a vessel may be surrounded in all directions, but by the next morning the ice is all gone without the assistance of any perceptible current. It is popularly said that the ice gets honeycombed and rotten and sinks; but ice being much lighter than water will not sink. The temperature of melting ice is 32° F., while the temperature of the water a little way below the ice is much higher. There is, therefore, a vertical interchanging circulation, the warmer water from below rises and melts the under surface of the ice; the melted ice, having a temperature of 32° F., sinks, but the ice itself does not. When the ice is observed to become honeycombed, it means that the lower warmer water is rising and melting it. A similar effect is, of course, produced by warm rain water. To a certain extent strong, dry winds, by evaporating the surface of the ice, cause it to disappear; if the winds are warm the ice becomes honeycombed and soft, but if the winds are very cold the ice remains firm and hard until it has disappeared. Under the influence of cold northwest winds the surface of the ice remains clear, clean, hard, and cold, so that the blocks and fields maintain their blue color, whereas honeycombed ice is whitish.

BENEFITS AND INJURIES DUE TO STORMS.

We hope that some one will have the patience to make out a balance sheet showing the good and evil done by storms throughout the whole United States. We notice that one of the severest storms, most disastrous in the Eastern States, is said to have been of untold benefit to the ranges of New Mexico and Colorado. The large amount of snow that falls in the mountains may avert a water famine during the coming summer. Again, we often notice that the winds which bring heavy rains to the Pacific coast bring droughts to the interior, and the winds that destroy vessels on the Atlantic coast bring rains to the interior of the Atlantic States. The cold waves that injure the vegetation of the Gulf States dissipate the yellow fever. No matter how much man complains of the weather, it would seem after all to be very satisfactory to the human race in general; it would seem to be a case where man grumbles at the blessings that are showered upon him, and we believe that a careful review of every aspect of the question would tend to make us better content with existing arrangements. Every newspaper paragraph enumerating the injury done by a storm should be paralleled by one enumerating its blessings.

A certain snowstorm is said to have cost the Chicago and Alton Railway Company over $25,000; the wages paid to the snow shovelers, the diminution of freight and passenger business, the extra cost of handling traffic, the spoiling of delicate freight, the double heading of the engines, the expense of the snow plows are all counted as a loss to the railroad; but the farmer welcomes the snow for the good it does to the crops in ground, and the railroad will doubtless find its losses in the winter more than balanced by its gain in business during the summer.

WEATHER BUREAU MEN IN UNIVERSITIES.

Mr. Alexander G. McAdie, Forecast Official, as honorary lecturer in meteorology in the University of California, has delivered a series of four lectures on meteorology at Berkeley, as introductory to scientific work in this department. The titles of his four lectures are: Forecasting the Weather; Lightning; Exploring the Air; Storm Structure.